ELTORQUE

User Manual

QT250 & QT800 Electrical Part-turn Valve Actuators

Revision Date: 25.10.2013

Revision history

Rev	Revision date	Done by	Approved by	Changes
1	13.01.2011	TEN		Changed company logo and front page image.
2	22.01.2013	TMM	BN	Product update
3	25.10.2013	TMM	BN	Technical data updated
4				
5				

Referenced documentation

Technical Manual_Eltorque Interfaces
Eltorque Manager 2 Manual

TABLE OF CONTENTS

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1. INTRODUCTION

Eltorque is a model range of electric valve actuators suitable for use in a wide variety of industrial environments.

The Eltorque actuators are characterized by:

- Compact size and good torque to size/ weight ratio
- Flexible control interfaces for easy integration with a wide range of control systems
- Low power consumption
- Electronic configuration of speed, torque and other parameters
- Easy and cost effective installation
- Maintenance free

The QT250 is suitable for use on part-turn valves with an operating torque below 250 Nm, while the QT800 is suitable for 250-800 Nm.
Most part-turn valves utilize quarter-turn (90°) movement, but the QT250 & 800 can easily be configured to an operation area within the range 0-359°. During the purchasing process, it is important to consider the following parameters:

Valve interface
It must be checked that the spindle and valve mounting holes either fit directly onto the actuator or alternatively consider spindle adapters and valve brackets.

Max operation torque
The actuator must have sufficient torque to operate the valve in all applicable conditions.

Closing time
This is usually determined as a part of the process development. In some cases, the closing time should be as short as possible if the valve for example is shutting down a system in case of failure. In other cases it is desired with a longer closing time to avoid shock waves in pipe systems with high pressure or flow.
The QT250 & 800 has an electronically configurable closing time.

Remote Control
The QT250 & 800 can be controlled remotely by different types of control:

- Digital (Open-Close)
- Analogue (4-20 mA)
- Modbus (Fieldbus, max 32 actuators per network)
- CANopen (Fieldbus, max 127 actuators per network)

For more details about the functionality of these Control Interfaces, refer to the “Technical Manual Eltorque Interfaces”.

Additionally, the actuator can be configured and controlled from a computer using a dedicated cable and software tool; Eltorque Manager 2.

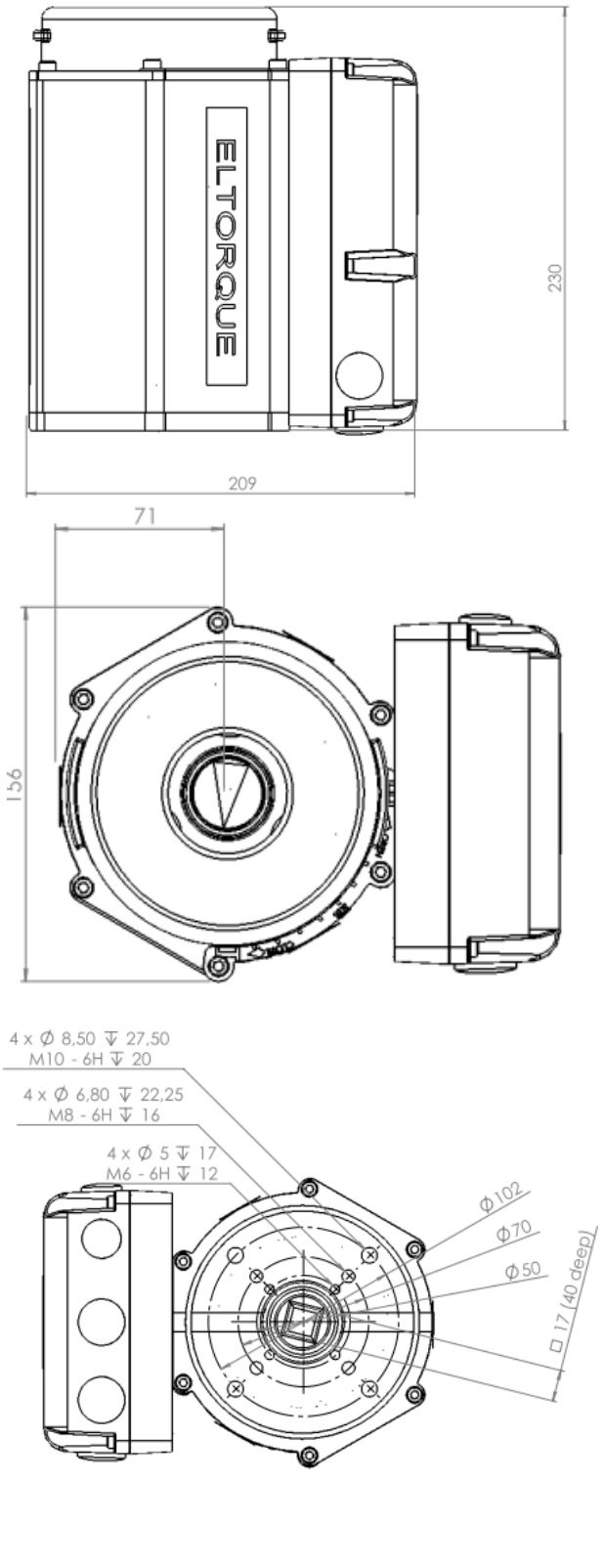
2. SPECIFICATIONS AND MANUAL OPERATION

2.1 Technical data

	QT250 1.0	QT250 2.0	QT800 1.0	QT800 2.0
Torque	50-250 Nm*		160-800 Nm*	
Closing time	0-90° movement: 13 -60 sec*		0-90° movement: 42 -180 sec*	
Dimensions (HxWxD)	229 x 156 x 209 mm		333 x 200 x 239	
Weight	12 kg		21 kg	
Valve flanges (Ref. ISO5211)	F05, F07 & F10		F10 & F12	
Standard valve adapter	SQ17		SQ27	
Valve applications	Butterfly or ball valves with part-turn operation Butterfly valve examples: DN50-DN200 PN16		DN250-DN350 PN16	
Operation temperature	-25 – 55 °C	-25 – 70 °C	-25 – 55 °C	-25 – 70 °C
Color	Black	Silver	Black	Silver
Encapsulation	IP68 (10m 72 hrs) Corrosion protected aluminium and steel enclosure			
Control interfaces	Digital (Open-Close) Analogue (4-20 mA) Modbus (Fieldbus) CANopen (Fieldbus)			
Position sensor	Range: 360° - 0,4° resolution Position feedback not corrupted by power failure			
Power supply	110-240V AC/DC, 50/60 Hz, Max 200 VA			
Power consumption	At 250/ 800 Nm load: <100 W/ 200VA Standby: <20W/ 50VA			
Over/ under temperature protection	Motor current is switched off in case of over-temperature Stator coils utilized as heating elements in case of low temperatures			
Manual operation	Manual override without tools, max 4 Nm torque			
	21 turns on hand wheel = 90° movement on valve		74 turns on hand wheel = 90° movement on valve	

* Configurable using Eltorque Manager 2 Software.

QT250



QT800

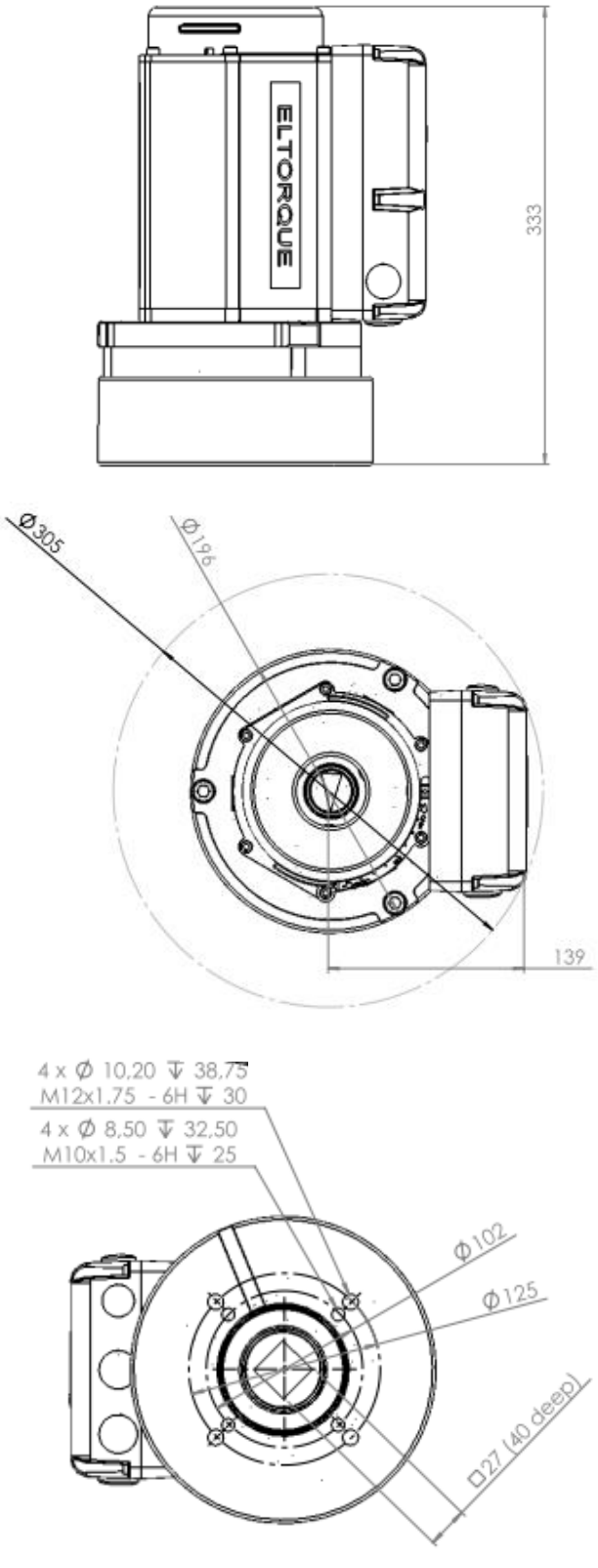


Fig. 1: External, valve flange and spindle dimensions

2.2 QT250 External construction

1. Motor and gear housing.
2. Bracket for control interface.
3. Control Interface Box.
4. Manuel operation cover.
5. Cable gland holes 5 x M20
6. Valve spindle shaft SQ17
7. Valve flange fastening holes
8. Valve position indicator
9. Valve position scale

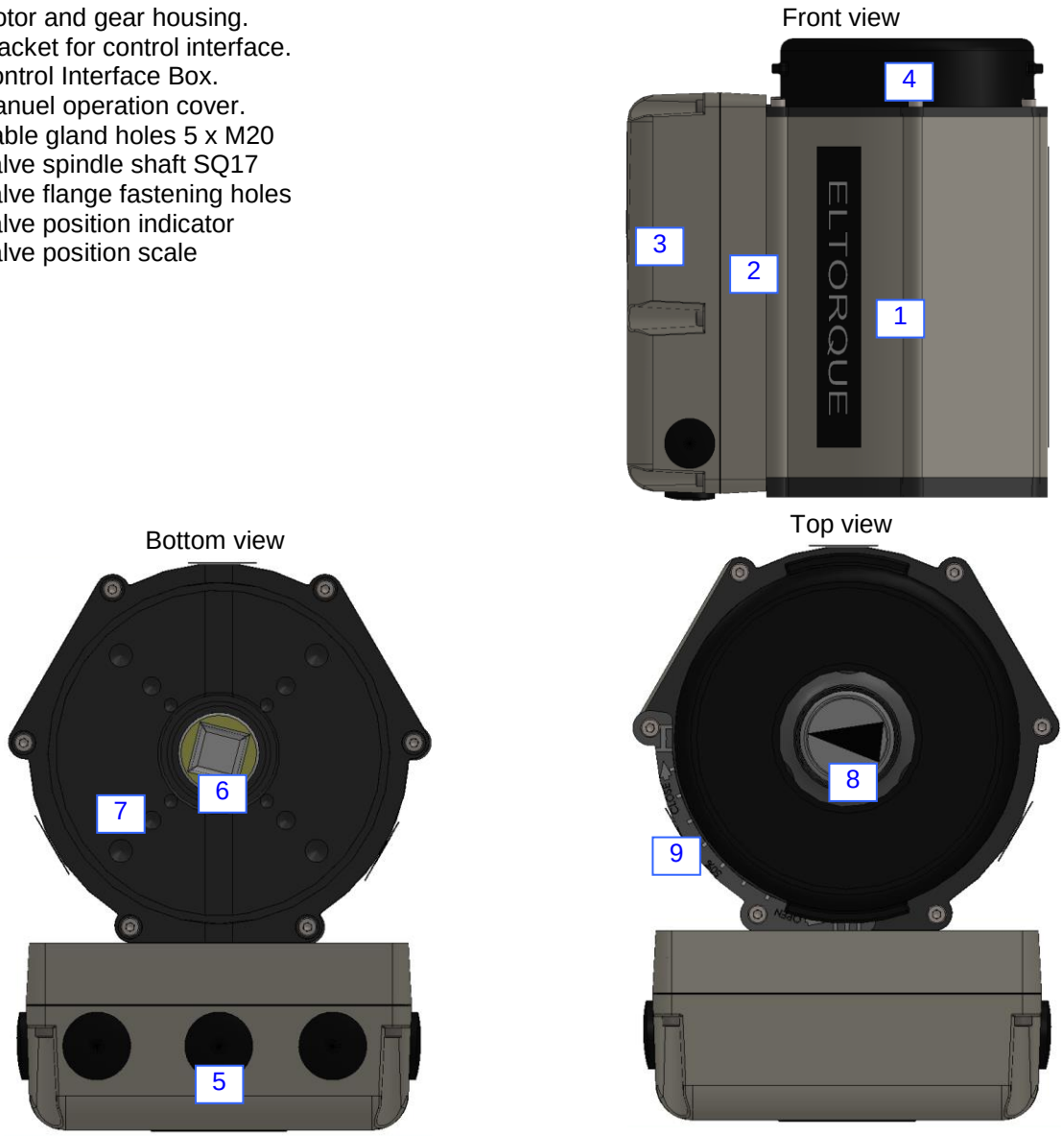


Fig. 2: QT250 External construction

2.3 QT800 External construction

1. Motor and gear housing.
2. Bracket for control interface.
3. Control Interface Box.
4. Manuel operation cover.
5. External gear housing
6. Cable gland holes 5 x M20
7. Valve spindle shaft SQ27
8. Valve flange fastening holes
9. Valve position indicator
10. Valve position scale

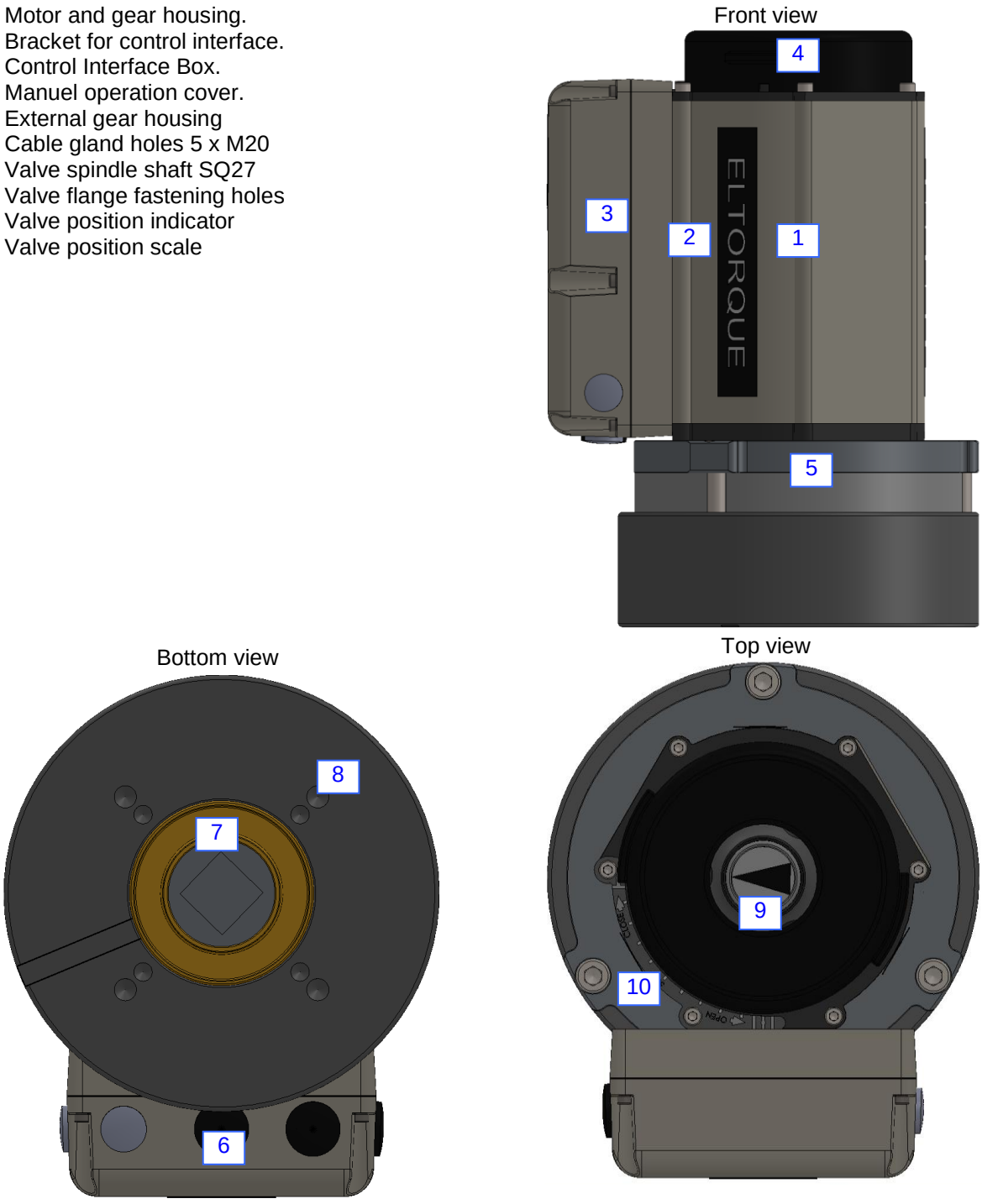


Fig. 3: QT800 External construction

2.4 Operating conditions

The QT250 & 800 1.0 is especially suitable for use below deck on ships and other offshore vessels due to its compact design, low power consumption and robust construction.
It can also be used in other applications as long as the following criterias are met:

- Operating temperature is kept within specified limits.
- Actuator is placed indoors and not exposed to direct sunlight.
- Protected from extensive corrosive atmospheres like on open deck of ships or other areas exposed to salt water spray. Cleaning or pollution with strong alkaline or acidic chemicals can also cause corrosion problems.
- Actuator must not be placed in hazardous areas where the presence of explosive atmospheres might cause explosion hazard.

QT250 & 800 2.0 is approved for use on open deck for ships and other offshore vessels.

2.5 Actuator duty type

When electric valve actuators operate, they generate internal heat due to thermal loss in motor and –control electronics. The QT250 and 800 combines low power consumption with high efficiency to ensure that internal thermal loss is kept low.
Still, duty cycle needs to be considered when designing the valve control system to ensure that the actuators can operate the valves without over-heating.
In case the actuator's internal temperature becomes too high, it will send out an alarm signal via the control interface. Should the temperature continue to rise, the actuator will shut down the motor until temperature decreases to a safe level.
To avoid problems with over-temperature alarms and actuator shutting down, duty cycle requirements should be considered before selecting actuator.

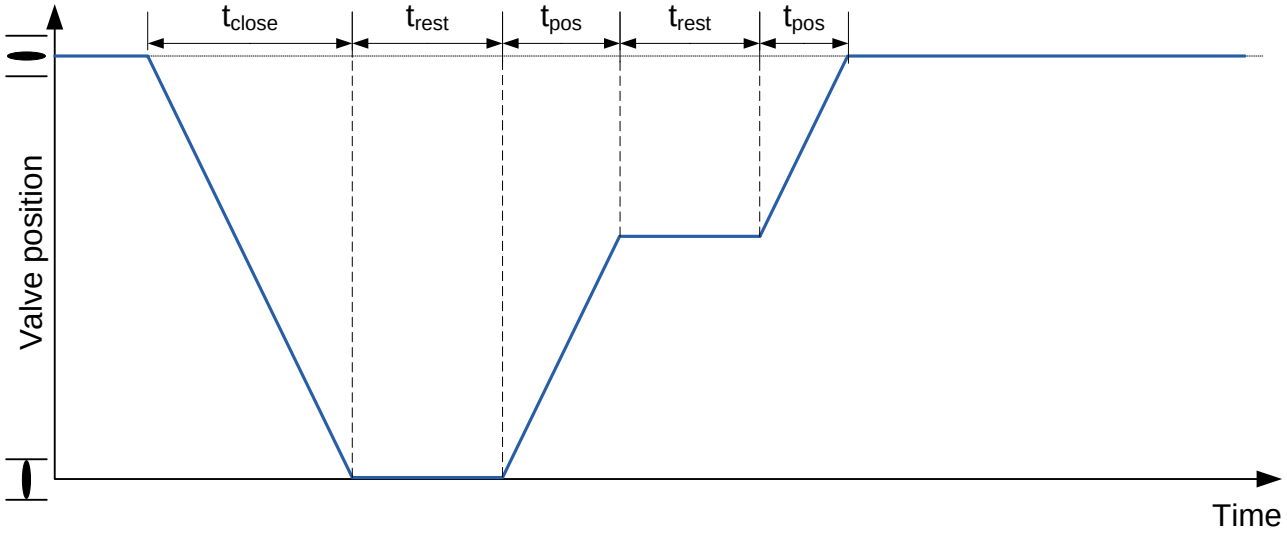


Fig. 4: Open-Close and positioning duty

Actuators used for Open-Close duty either open or close the valves, intermediate positions are not approached. The valves are rarely operated and the interval between operations may be a few minutes or even several months.
Open-Close duty will be relevant for QT250 & 800 actuators with Digital control interface.
Actuators used for positioning duty will approach defined intermediate positions to set a static flow through a pipeline, applicable positions also include Open and Closed.
Positioning duty will be relevant for QT250 & 800 actuators with Analogue or Fieldbus Interface.
For both these duty types, the same maximum continuous running time (t_{close} or t_{pos}) is 5 minutes followed by a rest period (t_{rest}) of minimum 5 minutes.

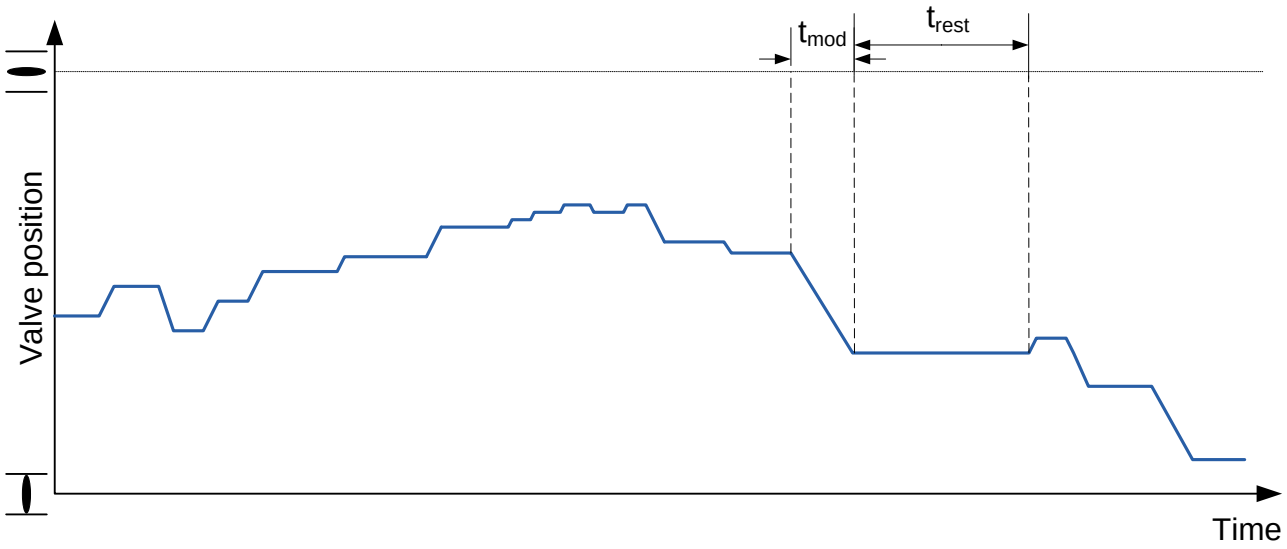


Fig. 5: Modulating duty

Modulating duty applies for actuators used on control valves where accurate and quick control of flow, level, temperature etc. is desired. The actuators will be controlled automatically by a regulator or PLC depending on process data from sensors like flow meters, level- and temperature sensors, and some applications might require valve position adjustments within intervals of a few seconds.
This kind of operation puts higher demand on the actuator in terms of accuracy, wear resistance, low internal heat generation and good heat dissipation.
Modulating duty is relevant for QT250 & 800 with Analogue or Fieldbus Interfaces.
Running time for modulating duty is limited by the relative on-time: $t_{mod} / t_{rest} < 0,5$.

The duty type limitations stated above applies for maximum operation temperature, and torque, see section 2.1.
If operating temperatures and or torque are lower, the actuator can be operated more than the duty type limitations stated above.

2.6 Manual operation

In case of power failure, control system error or another fault preventing normal operation of the actuator, it can be operated manually without the need of additional tools:

1. Remove hand-wheel cover by grabbing the tabs and pulling it straight up.

Fig. 6: Removing hand-wheel cover

2. Turn hand-wheel Clockwise to close or Counter-clockwise to open valve.
3. Valve position can be seen on the visual indicator in the centre of the hand-wheel and reference is made to the scale (D).
4. When Manual Operation is completed, refit hand wheel cover by pressing it down until it stops against the actuator's top cover.

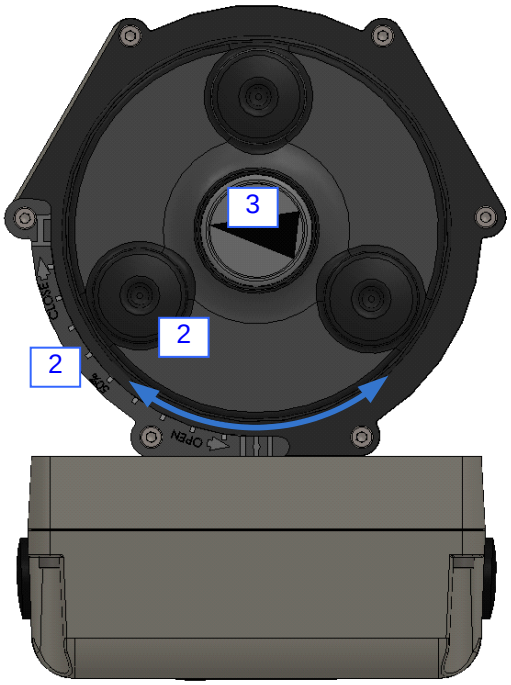


Fig. 7: Manual operation features

3. INSTALLATION

3.1 Mounting actuator on valve

Before mounting actuator, please make sure there is sufficient space for installation, service and manual operation above and around it:

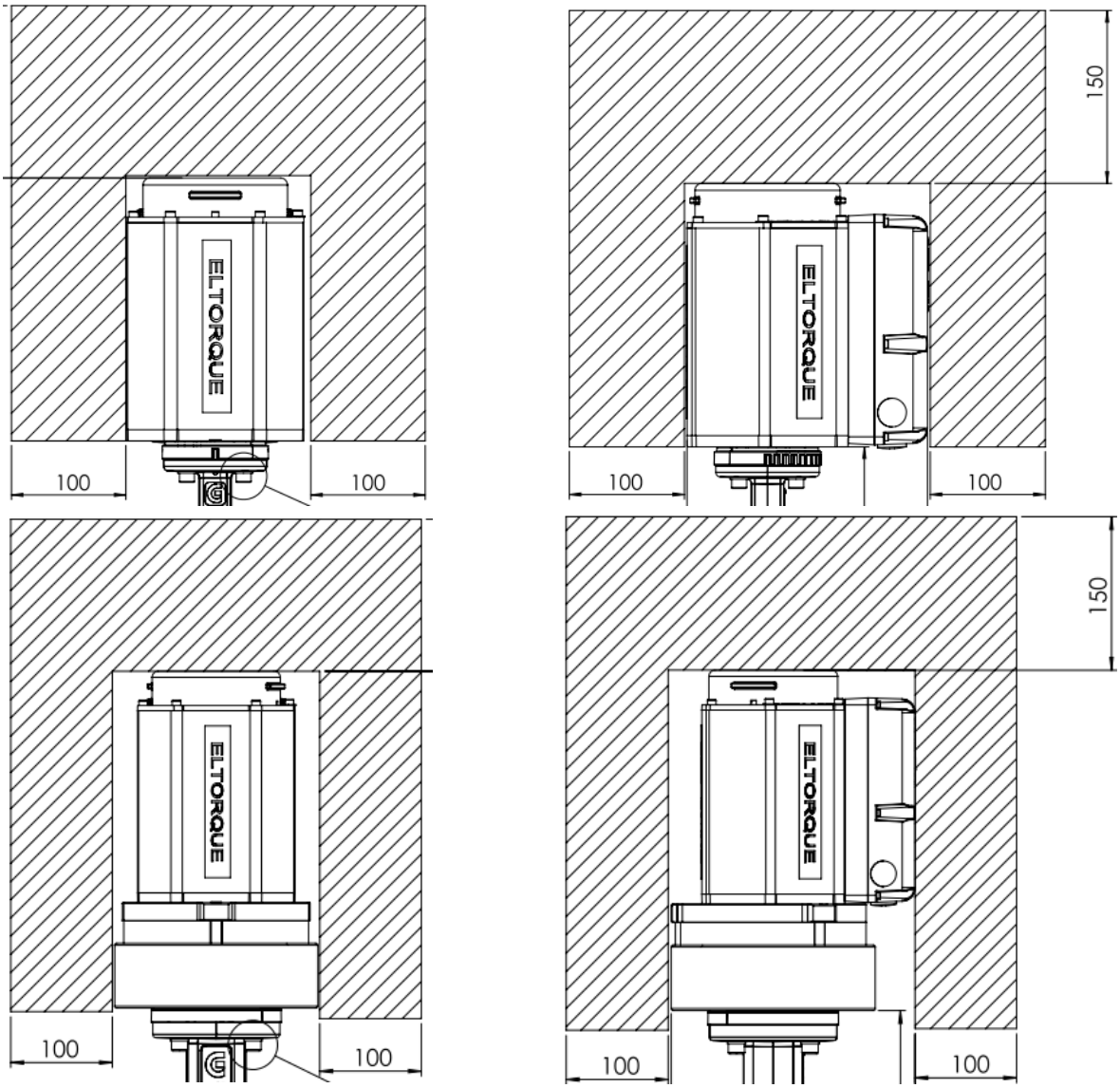


Fig. 8: Space for installation, service and manual operation

1. Apply grease on valve spindle to ease mounting and avoid corrosion.
2. Lift actuator onto valve; align its valve adapter with the valve spindle and lower actuator onto valve flange.
   Note: Keep hands away from the valve flanges to avoid crushing damages.

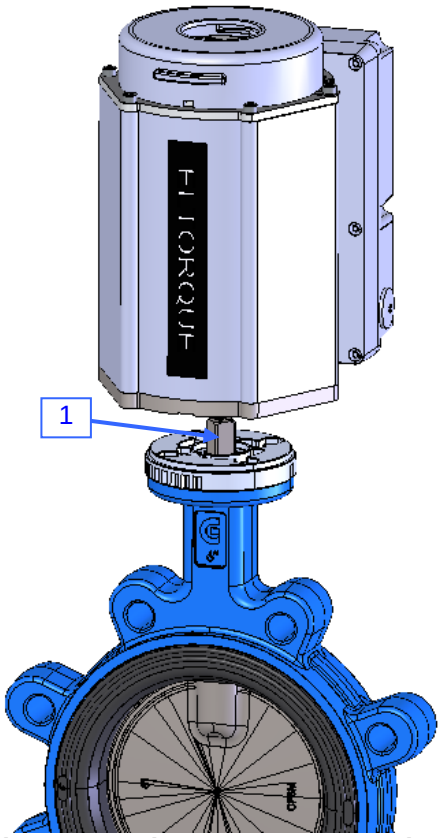


Fig. 9: Lowering actuator onto valve.

3. Use hand wheel to turn actuator and align fastening holes of the valve flanges.
   Note: In order to achieve optimal functionality of valve position indicator, actuator should be positioned as shown in Fig. 10 below.
4. Insert fastening screws and use washers according to ISO5211 standard and valve vendor's specifications.
5. Tighten fastening screws to the specified torque.

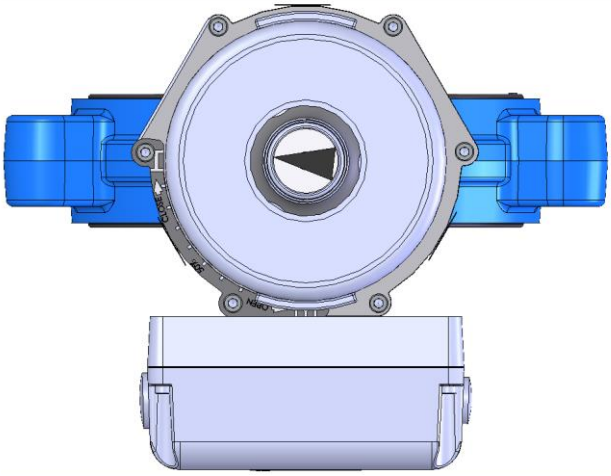


Fig. 10: Correct orientation of actuator.

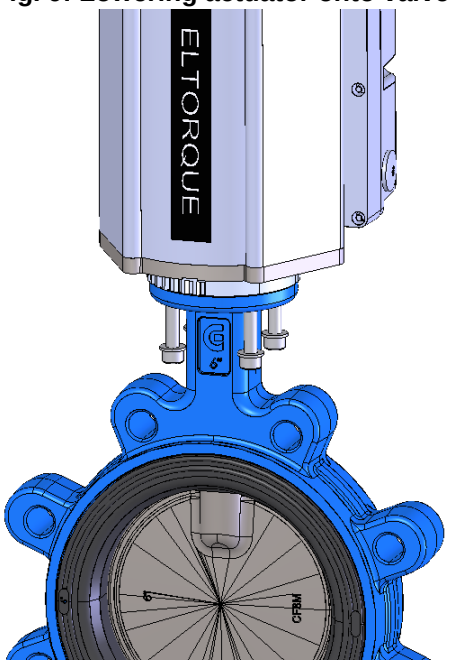


Fig. 11: Aligning fastening holes and inserting screws.

3.2 Electrical installation

Note: Electrical installation can only be designed and made by personnel with the appropriate skills and competence. Ensure all such work is done according to applicable laws and regulations.

1. Loosen control interface fastening screws, 6 pcs.
2. Remove control interface box by pulling is straight out.

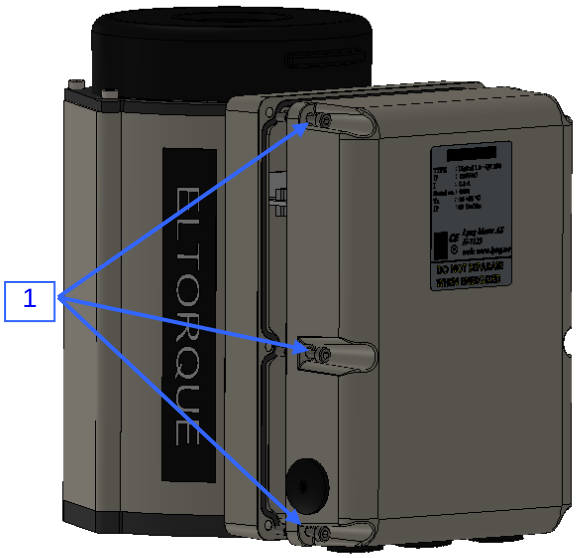


Fig. 12: Removing control interface box

Make sure fuses are disconnected before connection of power supply cables is started.

3. Install the power supply cables through the cable glands on the right side and connect them to the L, N and G/ PE terminals.
4. Install the control signal cables through the cable glands on the left and connect them according to X1 according to specification below.

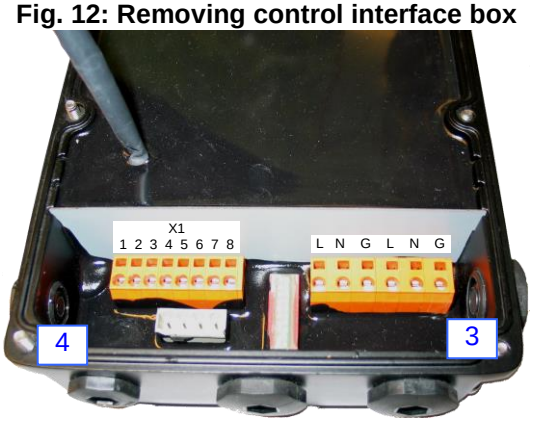


Fig. 13: Connection terminals location.

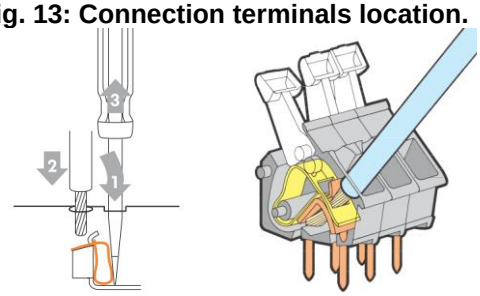


Fig. 14: Operation of spring loaded terminals

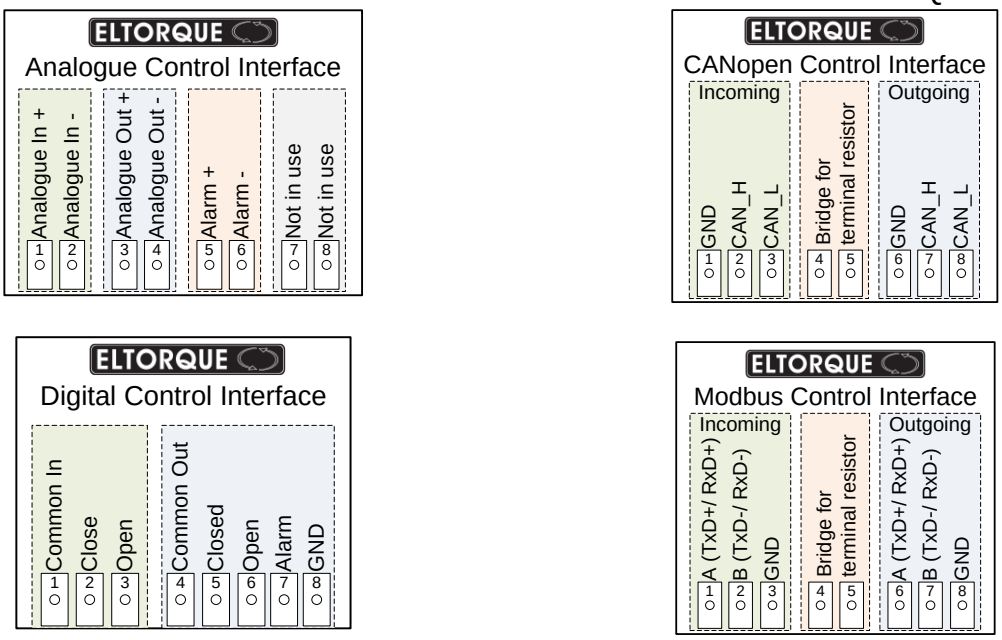


Fig. 15: Control signal connection terminals.

Control Interface functionality, cable recommendations etc. are described in ”Technical Manual_Eltorque Interfaces”.

3.3 Configuration of actuator

The QT250 and 800 actuators are configured electronically using the Eltorque Manager 2 software and a USB configuration cable. Manager 2 is distributed by e-mail or can be downloaded from our website, while the configuration cable can be purchased from local Eltorque distributor or the head office in Norway. (See page 2 for contact information)

The following parameters can be configured:
- End positions – Closed and Open.
- Speed, Torque and Near Closed region.
- Fieldbus address/ Node ID for CANopen and Modbus.
- Inversion of input and output for Digital and Analogue.

End positions and fieldbus address are mandatory, while the other parameters can be changed to achieve better valve control performance.

1. Install Eltorque Manager 2 and if required driver for configuration cable on your computer.

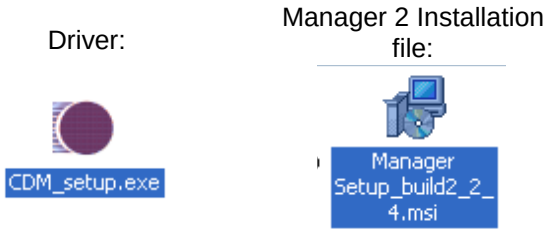


Fig. 16: Eltorque Manager 2 installation files.

2. Connect configuration cable to a USB port on your computer.
3. Start Manager 2

4. Connect cable to Actuator's configuration connector.

Note: Make sure actuator is powered before attempting to connect actuator with Eltorque Manager 2.

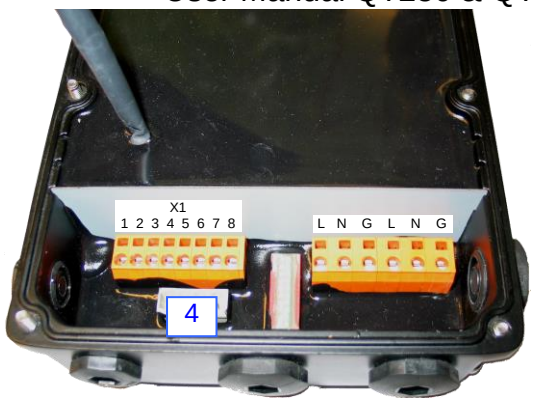


Fig. 17: Connection of configuration cable.

5. Press ***Connect*** to establish communication with the actuator.
6. Select appropriate configuration values depending on valve and control system, see section 3.4 for more information.
7. Use Hand-Wheel to move valve to closed position, see section 2.6 for details.
   Press ***Set C&O*** and Closed is set to the actual position, while Open is set 90° away in counter clockwise direction. If further adjustment of end positions are required, move actuator to desired position and press ***Set Closed*** or ***Set Open.***
8. Press ***Open*** to open valve and check that actuator operates correctly.
9. Press ***Close*** to close valve again.
10. Disconnect configuration cable and refit control interface.

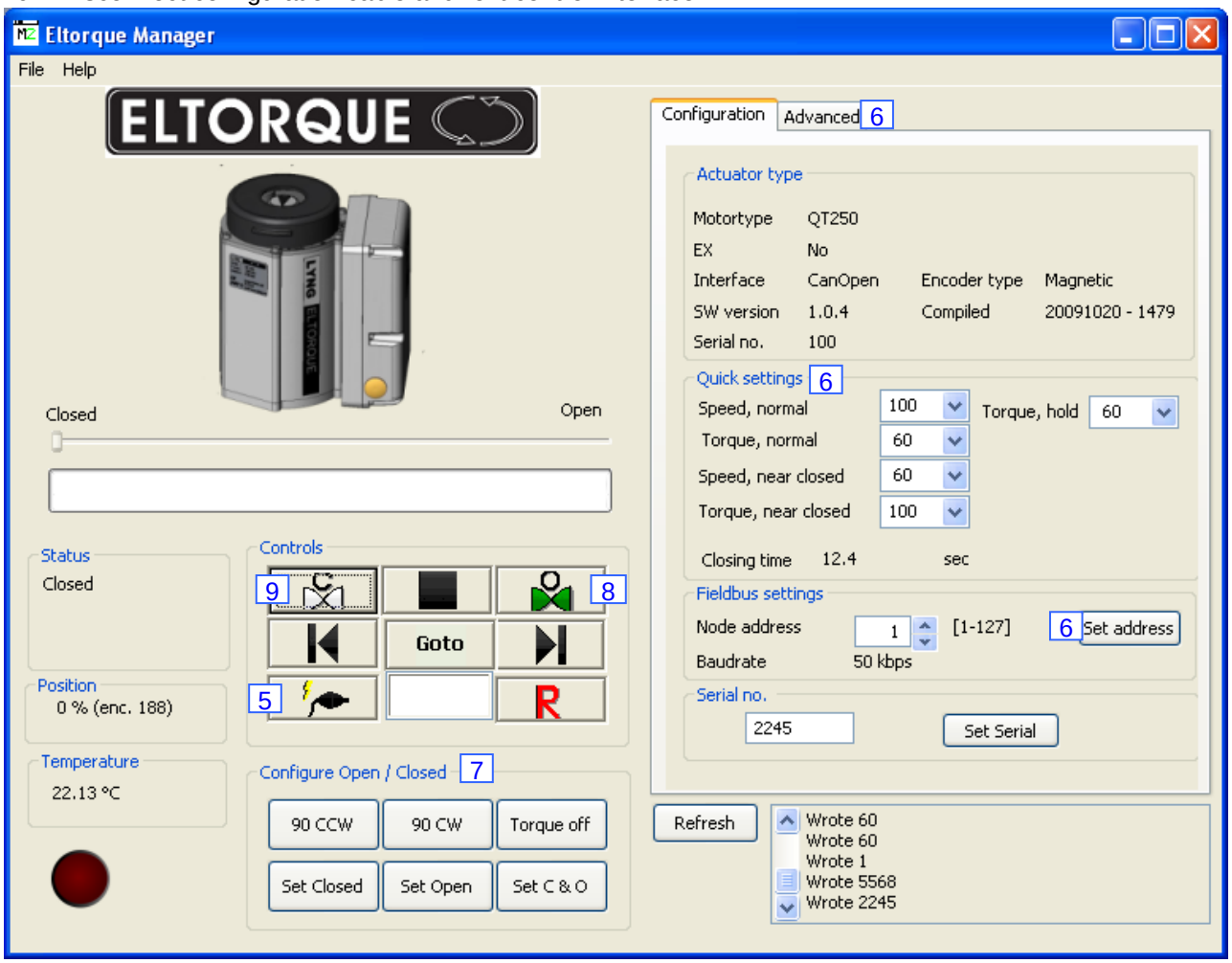


Fig. 18: Eltorque Manager 2 screenshot.

For more information about the functionality of the software, please refer to the Eltorque Manager 2 Manual.

3.4 Selecting correct configuration

The QT250 & 800 offers an easy but advanced configuration set-up, which allows accurate adjustments depending on valve and control system characteristics.
Please consider the following items when selecting configuration values:

- Set torque values according to valve's torque specifications with a suitable safety margin. If torque is set too high, the valve might be damaged in case it is blocked by e.g. foreign objects inside pipe.
- On butterfly valves, the maximum torque is required to move disc in and out of the gasket in closed position.
  Hence should only the torque in the near closed region be set according to the valve's specified operation torque. Torque in the travel area will be considerably lower.
- Ball valves tend to have a constant torque through the whole operation area, but the maximum torque is reached when the valve movement starts, so called "breakaway" torque.

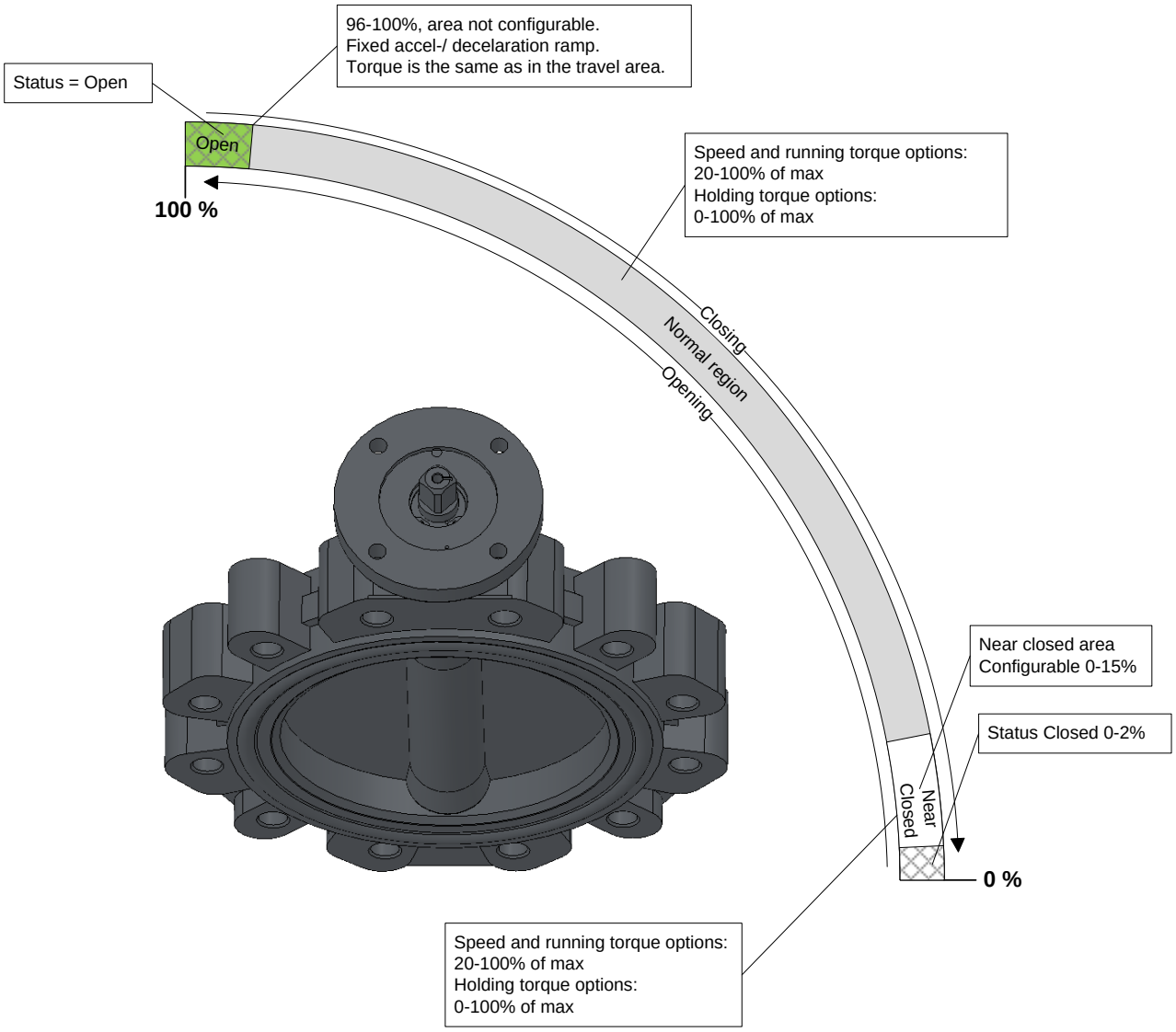


Fig. 19: Torque, speed and region settings.

- Under Fieldbus settings you can set the Node ID of actuators with CANopen or Modbus Control Interface. It is important that all actuators in the network have a unique Node ID and that it is set correctly according to the layout of the control system.
- In case the actuator has Analogue or Digital interface, the Fieldbus settings will be replaced by settings related to calibration and inversion of input and output signals.

Refer to Technical Manual_Eltorque Interfaces for more information.

4. MAINTENANCE, SERVICE AND TROUBLESHOOTING

4.1 Maintenance

The QT250 & 800 is in principle maintenance free; all bearings and gears are lifetime lubricated and components are designed to last throughout the actuator's lifetime. It is however recommended that the actuator is inspected regularly to reveal any damages caused by mechanical impact, corrosion etc. Top cover gasket and manual operation shaft seal should be lubricated with suitable lubricants if they appear to be dry.

4.2 Spare parts

1. Control Interfaces:

Part No.	Description
100.030.2	QT250/800 Analog 1.0
100.020.2	QT250/800 CanOpen 1.0
100.021.2	QT250/800 CanOpen 2.0
100.010.2	QT250/800 Digital 1.0
100.011.2	QT250/800 Digital 2.0
100.040.2	QT250/800 Modbus 1.0

Note: If control interface is replaced, it must be re-configured using Manager 2 as described in section 3.3.

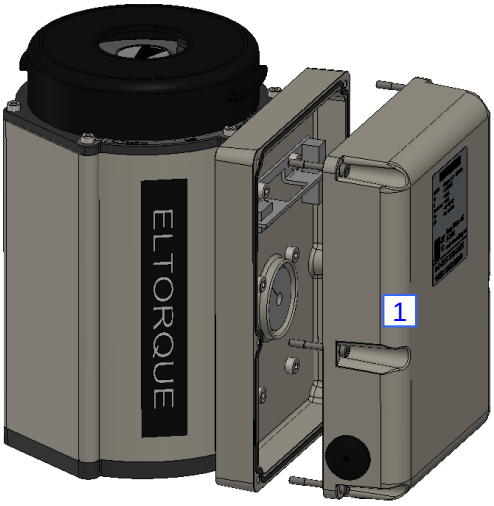


Fig. 20: Control interface.

Item	Part No.	Description
1	30003	PROTECTIVE COVER Ø115
2	35002	POSITION INDICATOR ARROW
3	40017	POSITION INDICATOR
4	10013	HEX SCREW M4 X 8 DIN912
5	40014	WHEEL A1 Ø117
6	40018	LID A1 PROFILE Ø131,5 (INCL.SHAFT SEAL)
7	20008	O-RING 114,5 X 3
8	35003	0-90 DEG SCALE
9	40015	BRACKET FOR EL-BOX(BLACK)
10	10012	NUT M4 DIN934
11	20006	GASKET BRACKET CAPSULE
12	45017	CONTACT HOLDER
13	10014	HEX SCREW M5 X 20 DIN912 A4
14	20003	O-RING Ø129,5 X 3
15	10026	HEX SCREW M5 X 8 DIN7984
16	10025	SPRING WASHER M5 DIN127B
17	10024	HEX SCREW M6 X 60 DIN7984
18	30002	STRIPS 430 X 4,8
19	100.003	BOTTOM & ENCODER ASSEMBLY
20	45009	CAPSULE A1 BLACK Ø131 X 183
21	35004	ELTORQUE MARK
22	10010	HEX SCREW M5 X 12 DIN912
23	25005	CABLE BUSHING PLUG
24	20005	SHAFT SEAL TR615-6 SS
25	100.002	ASSEMBLY STATOR
26	45008	ROTOR Ø101-48P-0,4T
27	25007	MOLEX 6 PIN CHASSIS
28	10018	HEX SCREW M4 X 8 DIN 7984 A4

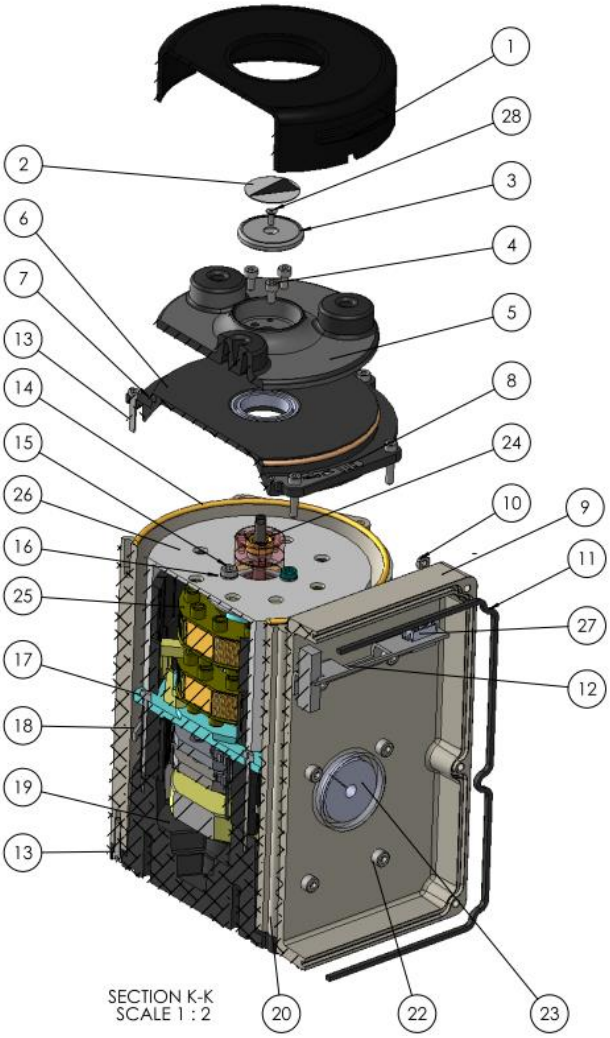


Fig. 21: Actuator spare parts

4.3 Troubleshooting

Problem description	Cause & solution
No response from actuator either on the control system or if you connect with Manager 2. No change in resistance on the hand wheel if you cycle the power supply.	No power supply, check fuses and wiring. Supply voltage can be checked using a voltage meter. L-N voltage should be 230 V AC ± 20%.
Actuator's alarm output is active, on a fieldbus system it gives torque alarm. The actuator attempts to move valve when a control signal is given.	Valve operation torque is too high, please check torque by manual operation. Be aware that foreign objects in the pipe can block the valve and that valve torque changes over time. **OR** Actuator torque has been set too low, increase it by using Eltorque Manager 2 as described in section 3.3. On fieldbus control systems, torque can be adjusted via the fieldbus communication.
Actuator is able to operate the valve but the operation time is longer or shorter than desired.	Change actuator's speed by using Eltorque Manager 2 as described in section 3.3. On fieldbus control systems, speed can be adjusted via the fieldbus communication.
Actuator's alarm output is active, on a fieldbus system it gives temperature alarm. The actuator responds normally to control signals.	Actuator's internal temperature is 10° C or less from the motor current shut-down limit. If possible, allow actuator to cool down by leaving it in standby mode for 15 minutes or more.
Actuator's alarm output is active, on a fieldbus system it gives temperature alarm. The actuator does not respond to control signals.	Actuator has over-heated and the motor current is shut down to prevent damage. Make sure surrounding temperature is within limits and that the duty type requirements are followed. See section 2 for more details.
Indicator LED is "normal". The actuator does not respond to control signals. On a fieldbus system, the actuator is not available.	Faulty control system, please ask system vendor for support. **OR** Problem with control signal wiring, please contact local Eltorque agent for support.
Actuator with fieldbus interface does not respond to control signals. The actuator responds normally when tested with Manager 2.	Incorrect fieldbus settings, please check configuration with Manager 2. **OR** Fieldbus control system is not wired or configured correctly.
Actuator with digital or analog interface does not respond normally to control signals. The actuator responds normally when tested with Manager 2.	Incorrect digital or analog inversion settings, please check configuration with Manager 2. **OR** Digital or analog control system is not wired or configured correctly.
Actuator does not respond neither to control signals nor when tested with Manager 2. Actuator power supply is verified with voltage meter.	Defective control interface, must be replaced.
After replacement of interface, actuator does not operate correctly.	Interface has not been configured correctly, please refer to section 3.3. Contact local Eltorque agent for support if required.

5. APPENDIX

5.1 Ordering information

Part number	Description
250.020.1	QT250 1.0 with CANopen Interface
250.021.1	QT250 2.0 with CANopen Interface
250.110.1	QT250 1.0 with Digital Interface
250.111.1	QT250 2.0 with Digital Interface
250.130.1	QT250 1.0 with Analog Interface
250.140.1	QT250 1.0 with Modbus Interface
800.020.1	QT800 1.0 with CANopen Interface
800.021.1	QT800 2.0 with CANopen Interface
800.110.1	QT800 1.0 with Digital Interface
800.111.1	QT800 2.0 with Digital Interface
800.130.1	QT800 1.0 with Analog Interface
800.140.1	QT800 1.0 with Modbus Interface

5.2 Terminology

Term	Description
Valve	A valve is a device that regulates the flow of materials (gases, fluidized solids, slurries, or liquids) by opening, closing, or partially obstructing various passageways. This manual mostly refers to quarter-turn valves with a 90 degrees movement between Closed and Open position.
Valve actuator	An electric device for operation of valves in various process control systems.
Valve flange	The surface of the valve which the actuator is fastened to. Most commonly it is holes for 4 screws, where hole size and distance between them is defined in EN ISO 5211 standard.
Valve adapter	A device used to connect the actuator to the valve spindle/ stem.
Control Interface	Electronic device controlling the valve actuator according to signals from an overall control system. e.g. PLC or other type of electronic controller.
Configuration	The set-up of parameters, which affects the actuator's performance and behaviour.
Hazardous area	Area in which the permanent or periodical presence of explosive substances causes a risk of explosion.
PLC	A Programmable Logic Controller is a digital computer used for automation of industrial processes, such as control of machinery on factory assembly lines, measurement and control of process plants etc.
Digital Control	Simple control utilizing relays, on/ off switches and indicators. Allows only Open or Closed functionality for a valve actuator.
Analogue Control	Step-less control utilizing analogue current or voltage signals, e.g. 4-20 mA, 0-10 V etc. Allows positioning of the valve actuator between Open and Closed.
Fieldbus Control	A fieldbus is an industrial computer network for real-time distributed control of various devices, including valve actuators. When Eltorque valve actuators are controlled by Fieldbus, the functionality is extended in terms of positioning, commands, feedback and configuration.
Modbus	The Eltorque Modbus interface is using RS-485 serial communication utilizing the Modbus protocol. Modbus is a fieldbus which allows communication with max 31 actuators connected to the same "master-slave" network. "Master-slave" means that the Modbus controller is a master which actively sends commands and requests to the "slave actuators".

Term	Description
CANopen	The Eltorque CANopen interface is using the CAN (Controller Area Network) communications standard. CANopen is a fieldbus which allows communication between max 127 actuators connected to the same network. It is not a “master-slave” network (ref. Modbus), hence all nodes in the network can actively send messages at their own initiative. The communication is prioritized, meaning that urgent messages are transmitted and received before information with lower priority. Compared to Modbus, CANopen has the following advantages: • More reliable communication, i.e. it is more likely that the information transmitted is received correctly by the recipient. • More nodes pr network, max 127. • More control and configuration features available.

5.3 Control system examples

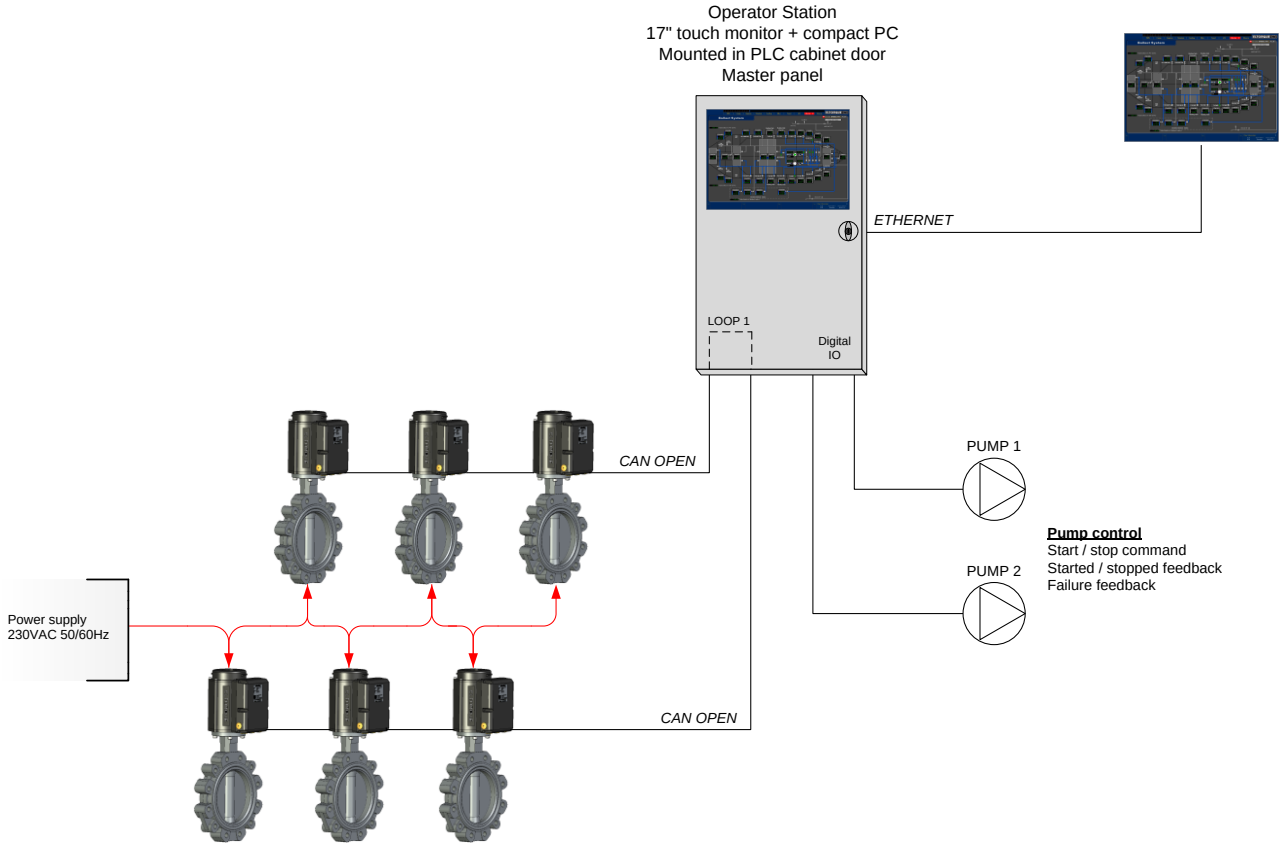


Fig. 22: Stand-alone valve and pump control with operator stations.

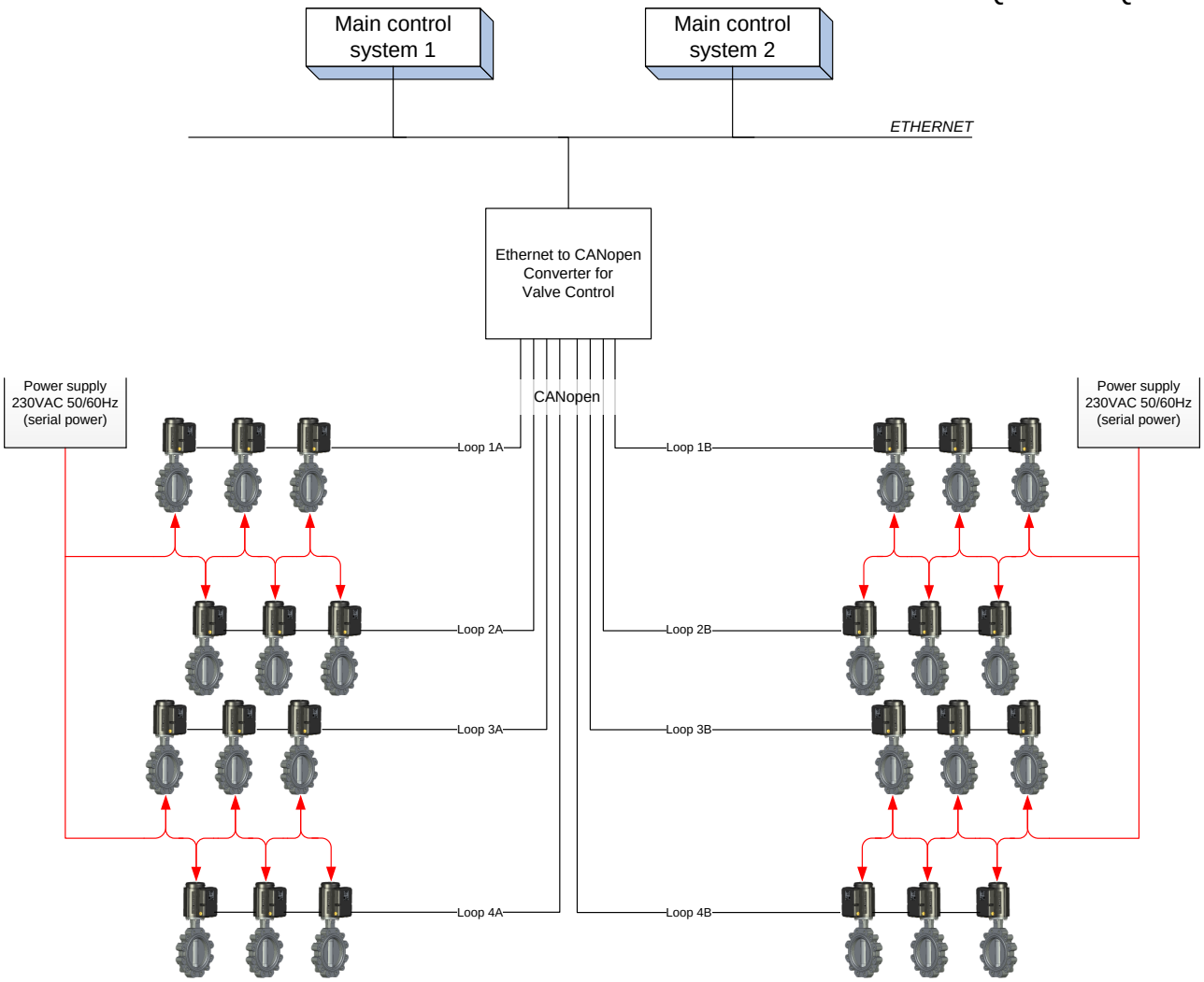


Fig. 23: Valve control system as an integrated part of a larger control system.

5.4 Notes